

# **OROVILLE FACILITIES RELICENSING (FERC PROJECT NO. 2100)**

## **PROGRESS REPORT SP-W7**

### **LAND AND WATERSHED MANAGEMENT EFFECTS ON WATER QUALITY**

**REVIEW DRAFT**

#### **PREPARED BY:**

Contact: Jerry Boles  
Telephone: (530) 529-7326  
bolesj@water.ca.gov

**JANUARY 2003**

## **SPW7. Land and Watershed Management Effects on Water Quality**

### **Task 1. Effects from Ongoing Land Uses and Management**

#### **Task 1A. Identification of Potential Effects to Water Quality**

##### **Executive Summary**

Land and watershed management activities within and adjacent to the project area have the potential to affect water quality and other aquatic and terrestrial resources. Land and watershed management activities were reviewed, and potential effects to project waters were identified. Land uses within 1/2 mile of the project fall into several broad categories, including agriculture, commercial, industrial, railroad, residential, roads and streets, and miscellaneous, which includes lands under jurisdiction of State or federal entities. Potential contaminants identified from these land uses and management activities include pesticides, sediments, bacteria, petroleum byproducts, metals, and nutrients. However, adequate controls exist that would preclude potential contaminants from most land uses to affect project waters. Several land uses or management activities, though, may affect project waters. Monitoring is proposed to ascertain effects to project waters from land exposed to erosion due to agricultural practices, runoff from commercial land uses, urban runoff, and chemical control of pest populations.

## **Oroville Facilities Relicensing (Project No. 2100)**

### **SPW7. Land and Watershed Management Effects on Water Quality**

#### **Task 1. Effects from Ongoing Land Uses and Management**

#### **Task 1A. Identification of Potential Effects to Water Quality**

### **1.0 Introduction**

Land and watershed management activities within and adjacent to the project area have the potential to affect water quality and other aquatic and terrestrial resources. The Environmental Workgroup raised several issues related to land and watershed management effects on aquatic and terrestrial resources, including:

- protection of riparian areas and water quality by limiting disturbance in streamside management zones
- use of Best Management Practices during land use and management activities to avoid water quality degradation
- rehabilitation of deteriorating watersheds to reduce channel erosion, sedimentation, and sediment yield
- plan and manage on a watershed scale in cooperation with other agencies and private landowners
- effects of land use and management activities on terrestrial plant and animal communities and habitats.

Most of the land within the watershed upstream from Oroville Dam is owned by the federal government, and is predominantly managed by the U.S. Forest Service with smaller holdings managed by the Bureau of Land Management and some dispersed lands in private ownership. Some of the lands in private ownership along the tributaries to Lake Oroville have been developed with hydroelectric generation facilities, especially along the North Fork by the Pacific Gas and Electric Company. A small portion of the land within the project boundary upstream from Oroville Dam is managed by the USFS and BLM, but most of the land is owned by the State. The Department of Parks and Recreation manages the water surface area of Lake Oroville and shoreline areas typically from the waterline to about the 1,100-foot elevation. The Department of Fish and Game manages the Oroville Wildlife Area downstream from the dam. A minor amount of private lands are included in the project boundary, but adjacent residential and commercial developments on private property fall under the management jurisdiction of Butte County.

Lands within the watershed upstream from the dam are managed under several land and resource management plans, including the Plumas National Forest Land and Resource Management Plan, BLM's Redding Resource Management Plan and Record of Decision, and Butte County General Plan. Downstream from the dam, the City of Oroville manages land under the General Plan. Within the project boundary upstream from the

dam, land is managed under DWR's Recreation Plan for Lake Oroville State Recreation Area, USFS's LRMP, BLM's RRMP, and DPR's Resource Management Plan and General Development Plan, Lake Oroville State Recreation Area, while downstream areas are managed under DFG's Oroville Wildlife Management Area Management Plan.

The myriad of ownership and land management plans and activities in conjunction with the relatively small portion of the watershed actually under control of DWR results in little ability of DWR to effectively manage land within the watershed. Nonetheless, DWR can work with adjacent property owners on land use and management activities, as well as those within the project boundary, that affect resources on project lands.

## **2.0 Objective**

The objective of the study is to evaluate the potential effects of land and watershed management activities on the physical, chemical, and biological integrity of project waters. Effects from project facilities and operations to the integrity of project waters, as well as general water quality conditions, are evaluated in SPW1. This study will identify potential localized effects to water quality from specific land and watershed management activities.

## **3.0 Relationship to Relicensing/Need for the Study**

The study will be used to demonstrate the post-project effectiveness of the land use practices on the biological, physical, and chemical integrity of waters within the project area. The U.S Fish and Wildlife Service and the National Marine Fisheries Service require this information to determine project effects on the habitat of listed species, including salmon and steelhead. The State Water Resources Control Board will use this data in their water quality compliance evaluation for the issuance of a Section 401 Water Quality Certification.

## **4.0 Study Area**

The study area is generally within the project boundary, but also includes adjacent lands and waterways for effects to project waters, and downstream for project effects in the Feather River.

## **5.0 Methodology and Analysis**

This study is focused on identifying land and water management activities within and adjacent to the project area and evaluating the potential of these activities to affect water quality. Data obtained from the study will be compared to water quality goals and criteria for protection of beneficial uses. Information from land use plans was obtained, as necessary, from other agencies to evaluate potential contamination and their sources from land use activities.

Information on land and watershed management on adjacent lands was obtained from the Butte County Assessor's Office, Plumas National Forest, City of Oroville, and Bureau of Land Management. The Butte County Assessor's Office provided parcel land use and ownership data of the entire county. The data were imported into ArcView GIS for analysis.

Specific proposed monitoring was developed following determination of the potential for each type of land use activity to affect project waters. The monitoring program is designed to target specific land use activities with potential to introduce contaminants into project waters and will be presented to the Environmental Work Group for review and approval prior to implementation.

## **6.0 Results and Discussion**

There are approximately 42,548 acres within the project boundary, with 98.9 percent of the acreage under government ownership (Table SPW7-1) and 86.1 percent of all lands under State control. The California Department of Parks and Recreation is the largest land manager, with 57.6 percent or 24,498 acres of the project area. The land use on lands managed by CDPR is related primarily to recreational activities, with CDPR maintaining recreational facilities (e.g., boat ramps, campgrounds, restrooms, and trails). The potential effect of recreational facilities is addressed under Study Plan SPW3.

In ArcView, a 0.5 mile buffer was drawn around the project boundary for analysis. The buffer area contained an additional total of 56,402 acres, not including the 42,548 acres within the project boundary.

**Table SPW7-1. Ownership Acreages Within the Project Area**

<b>Agency/Land Manager</b>	<b>Acres within Project Area</b>	<b>Percent</b>	<b>Acres within 0.5 mile buffer*</b>	<b>Percent</b>
<i>Federal</i>	<i>5,696</i>	<i>13.4</i>	<i>6,072</i>	<i>10.8</i>
- Bureau of Indian Affairs			43	0.1
- Bureau of Land Management	4,325	10.1	823	1.5
- U.S.D.A., Forest Service	1,371	3.3	5,206	9.2
<i>State</i>	<i>36,391</i>	<i>85.5</i>	<i>162</i>	<i>0.3</i>
- Department of Fish & Game	11,893	27.9	-	
- Department of Parks & Recreation	24,498	57.6	162	0.3
<b>Subtotal</b>	<b>42,087</b>	<b>98.9</b>	<b>6,234</b>	<b>11.1</b>
Private Landowners	386	0.9	48,206	85.5
Roads & Streets	75	0.2	1,962	3.5
<b>Subtotal</b>	<b>461</b>	<b>1.1</b>	<b>50,168</b>	<b>88.9</b>
<b>Total</b>	<b>42,548</b>	<b>100</b>	<b>56,402</b>	<b>100</b>

\* Totals within the 0.5 mile buffer do not include those acres within the project boundary

Information derived from the first phase of this study was used to determine whether land and water use activities could affect the physical, chemical, or biological integrity of project waters. Each of the land use types within or adjacent to the project boundary (within 0.5 miles) was inventoried and assessed for potential impacts. This information identified types of land use activities (Table SPW7-2), as well as potential sources of contamination, source pathways, and operations and management that may contribute to contamination, and effectiveness of the facility or operations in preventing contamination.

#### Types of Land Use

The types of land use within and 0.5 miles adjacent to the project area were derived from information provided by Butte County (Table SPW7-2). Within the project boundary, the dominant land use type is Miscellaneous with 42,087 out of 42,548 acres (99 percent). These are the lands managed by State and federal agencies, primarily for recreational use. Within 0.5 miles of the project boundary, exclusive of the lands within the project boundary, there are 56,042 acres with seven major types of land use, including agriculture, commercial, industrial, residential/roads and streets, miscellaneous, and unknown/not assigned. The dominant land use types in the 0.5-mile buffer are residential at 21,637 acres and agriculture with 16,651 acres (Table SPW-7-2). Each land use type

has its own potential contamination concerns, such as pesticides from agriculture or chemical and metals from industrial land uses (Table SPW7-3).

**Table SPW7-2. Land Use Types and Acreages Within the Project Boundary and Outside of the Project Area to 0.5 Miles**

<b>Land Use Type</b>	<b>Acres within Project Area</b>	<b>Acres within 0.5-mile buffer</b>
Agriculture		<b>16,651</b>
- Almonds		118
- Dry Farming		27
- Field & Row Crops		22
- Grazing		5,545
- Irrigated Pasture		382
- Kiwis		9
- Miscellaneous		684
- Mixed Agriculture		597
- Mixed Fruits & Nuts		214
- Mixed Nuts		82
- Olives		39
- Prunes		54
- Rice		1,935
- Timber		5,283
- Vines		416
- Walnuts		1,244
Commercial	<b>194</b>	<b>4,615</b>
- Institutional	7	128
- Mining	111	35
- Miscellaneous		405
- Professional		31
- Recreation		88
- Residential (Motels, etc.)		134
- Retail		57
- Service		105
- Utility	76	3,361
- Vacant		306
Industrial		<b>477</b>
- Manufacturing		41
- Miscellaneous		94
- Vacant		332
- Warehouse		10
Railroad	<b>90</b>	<b>101</b>
Residential		<b>21,637</b>
- Occupied		7,700
- Vacant		13,937
Roads & Streets	<b>75</b>	<b>1,962</b>
Unknown/Not Assigned	<b>1,276</b>	<b>113</b>
Miscellaneous	<b>42,087</b>	<b>6,234</b>
- State of California	36,391	162
- USA	5,696	6,072
<b>Totals</b>	<b>42,548</b>	<b>56,402</b>



### SPW7-3. Potential Contamination Concerns by Land Use Type

Land Use Type	Potential Contamination
Agriculture	
- Almonds	Pesticides; Sediment
- Dry Farming	Pesticides; Sediment
- Field & Row Crops	Pesticides; Sediment
- Grazing	Bacteria; Sediment
- Irrigated Pasture	Bacteria; Pesticides; Sediment
- Kiwis	Pesticides; Sediment
- Miscellaneous	Bacteria; Pesticides; Sediment
- Mixed Agriculture	Pesticides; Sediment
- Mixed Fruits & Nuts	Pesticides; Sediment
- Mixed Nuts	Pesticides; Sediment
- Olives	Pesticides; Sediment
- Prunes	Pesticides; Sediment
- Rice	Pesticides; Sediment
- Timber	Pesticides; Sediment
- Vines	Pesticides; Sediment
- Walnuts	Pesticides; Sediment
Commercial	
- Institutional	Petroleum byproducts
- Mining	Metals; Sediments
- Miscellaneous	Petroleum byproducts
- Professional	Petroleum byproducts
- Recreation	Petroleum byproducts; Bacteria
- Residential (Motels, etc.)	Petroleum byproducts
- Retail	Petroleum byproducts
- Service	Petroleum byproducts
- Utility	Petroleum byproducts
- Vacant	No impacts expected
Industrial	
- Manufacturing	Chemicals; Metals; Petroleum byproducts
- Miscellaneous	Chemicals; Metals; Petroleum byproducts
- Vacant	No impacts expected
- Warehouse	Chemicals; Metals; Petroleum byproducts
Railroad	Metals; Petroleum byproducts
Residential	
- Occupied	Fertilizer; Pesticides; Petroleum byproducts
- Vacant	No impacts expected
Roads & Streets	Petroleum byproducts; Metals
Unknown/Not Assigned	Unknown
Miscellaneous	
- State of California	Nutrients; Pesticides; Petroleum byproducts; Sediment
- USA	Nutrients; Pesticides; Petroleum byproducts; Sediment

## Agriculture

In Butte County, agriculture is an important land use activity. Since there are no agricultural activities within the project boundary, potential contamination from agriculture is not an immediate concern. However, within the 0.5-mile buffer around the project boundary, there are 16,651 acres of agriculture out of 56,402 acres (about 30 percent). The types of agricultural activities are diverse, ranging from 9 acres of kiwi production to 5,545 acres of grazing.

Within the 0.5-mile buffer, there are 1,749 acres of orchard agriculture, primarily located south of the Thermalito Afterbay and west of the Oroville Wildlife Area. A variety of orchard crops are grown, including almonds, mixed fruit and nuts, olives, prunes, and walnuts. The primary contamination concerns from orchards are nutrient enrichment from fertilizer application and chemical contamination from pesticides. Sediment transport from orchards, which normally occurs at very low rates, can be quite high episodically as over-mature trees are removed during the re-planting process. However, since the re-planting process occurs on the order of decades, sediment is not a significant contamination concern from orchards.

Dry farming and field/row crops consist of only 49 acres within the 0.5 mile buffer, and is primarily in the vicinity of the Oroville Wildlife Area. Since there are so few acres of these types of agriculture which occur on essentially level land, there is little possibility of significant potential contamination from them.

Grazing and irrigated pastures on private lands (5,927 acres) is concentrated primarily along the West Branch North Fork Feather River arm of Lake Oroville and north of the Thermalito Afterbay, Power Canal, and Thermalito Forebay. The primary contamination concerns from grazing are bacteria from livestock manure and sedimentation from livestock-caused streamside erosion. Some minor contamination from pesticide use is possible but unlikely, since most ranchers do not apply many chemicals to their livestock ranging areas. Flooding is usually used to provide irrigation to pastures. This type of irrigation slightly increases the potential for contamination, since it could transport contaminants into project waters at the dry part of the year.

There are 1,935 acres of rice production within the 0.5-mile buffer concentrated around the north- to southwest areas adjacent to the Thermalito Afterbay. The Thermalito Afterbay is formed by a levee to contain the stored water. This has the effect of elevating the Afterbay above the surrounding landscape. Therefore, any potential for direct contamination of project waters by runoff from rice farming is very low. However, aerial spraying of pesticides to rice fields could possibly cause air-borne contamination of project waters.

Timber production on private lands (5,283 acres) is also considered an agricultural activity and tends to be concentrated in the area around the North Fork Feather River and

Middle Fork Feather River arms of Lake Oroville. The primary contamination concerns from timber production are pesticides and sediment. Any particular parcel within timberlands can be harvested on a roughly 20- to 30-year cycle, as per the Z'Berg-Nejedly Forest Practice Act of 1973 (Title 14 CCR), though this is not usually the case in practice. Normally, pesticide use is concentrated during the post-harvest season, which is usually around September. During re-planting of timber stocks on recently cut logging units (maximum 20 acres for a clearcut), pesticides are applied to control vegetation that could compete with the newly planted saplings. Sediment controls are installed prior to the start of harvesting and remain in place until they are degraded by the weather or overgrown. Hay bales and silt fences are common practices, especially on clearcuts. Waterbars and trenches are normally installed on logging roads and remain in place until the road is upgraded or retired.

Vineyards, which account for only 416 acres of agricultural land use activity within the 0.5-mile buffer assessment area, are scattered in relatively small parcels. Since many vineyard crops require well-drained soils, vineyards tend to be located on soils with some degree of sloping. To ensure that the soils are well-drained, the first planting usually requires extensive disking to improve drainage. The vines are planted in widely spaced rows onto trellis-like supports (usually upright wooden posts with smooth wire stretched between them). Additionally, vineyards tend to be re-planted every few years to reduce senescence (which inhibits production) and chance of disease. These conditions of disturbed soils, minimal ground cover, and widely spaced rows may lead to sediment laden runoff in the earlier years of a vineyard and periodically thereafter. Pesticide use is common to reduce insect damage and weed invasion.

To address the issue of potential pesticide contamination from the various agricultural areas, area-wide monitoring in the appropriate season is recommended. Pesticide use is highest during the growing season from April to September, but pesticides do not generally reach adjacent surface waters until the onset of the rainy season. While various pesticides may be applied at different periods during the growing or dormant season, most would not be a concern until rains produce runoff from the applied areas. Therefore, sampling for pesticides would be recommended to occur in the fall once rains produce significant runoff and again in February or March following application of dormant sprays. This sampling is already being conducted under SPW1, with sampling for pesticides occurring at all of the water quality stations immediately after the first significant rain in the fall and after the application of dormant sprays in the winter. Therefore, no new sampling for pesticides is recommended.

Tilling of soil for planting crops or weed control could result in erosion and deposition of sediments into project waters. Effects of erosion could show up as higher turbidity in project waters, but turbidity monitoring, which is being conducted under SPW1, does not identify the source. In addition, monthly visual inspection of the shorelines of project waters for turbidity plumes or other signs of erosion during the rainy season is recommended to assess the potential for erosional deposition into project waters. If

significant turbidity plumes are identified, potential sources will be identified, monitoring for deposition and turbidity will occur, and remedial actions will be instituted, if appropriate, or recommended.

Since grazing has the potential to introduce bacterial contamination to project waters, bacteria sampling should be performed around those areas where grazing seems to be concentrated (West Branch of the North Fork arm of Lake Oroville and north of the Thermalito Forebay/Afterbay). Sampling for bacteria is already occurring in these areas under SPW1. Therefore, no new bacteria monitoring is proposed.

### Commercial

There are 415 parcels totaling 4,309 acres of commercially used land (all types except vacant) scattered throughout the 0.5-mile buffer assessment area, plus 194 acres within the project boundary, but concentrated primarily within and around the City of Oroville and south along State Highway 70. Commercial activities could contribute primarily petroleum byproducts and metals to road runoff from automobile traffic.

Additionally, there are 132 parcels totaling 306 acres of vacant commercial designation. These are undeveloped lands within the City of Oroville that have no commercial land use activities. Potential contamination concerns from these areas would be insignificant.

To address the potential for petroleum byproduct and metals contamination would require area-wide water quality monitoring. Water quality monitoring, exclusive of petroleum byproduct monitoring, is already occurring under SPW1. Therefore, petroleum byproducts monitoring for polynuclear aromatic hydrocarbons (PAHs) and MTBE will be performed during the first three storms that produce significant runoff at the Study Plan SPW1 stations potentially affected by runoff from the City of Oroville.

### Industrial

There are 9 parcels totaling 41 acres of manufacturing industrial land use located south of Oroville and east of State Highway 70. Most of the remaining 436 acres of industrial land use is vacant lands (76 percent). In developed industrial areas, the primary contamination concerns would be chemicals and metals released during the industrial or manufacturing process. These facilities are not heavy industries, such as automobile manufacturing or steel production, but rather light manufacturing. The developed industrial area are relatively isolated from the project waters due to the presence of the highway and the Feather River levee system, which may alleviate much of the potential for surface contamination to project waters.

The Koppers Company wood treatment facility on State Highway 70 south of the City of Oroville is on the EPA Superfund Site List. This facility has been identified as being responsible for contamination of soil and groundwater by a variety of chemicals,

including pentachlorophenol (PCP), isopropyl ether, various polynuclear aromatics, copper, chromium, and arsenic. The groundwater contaminant plume originally ranged to about 1 1/2 miles south of the Koppers facility. In 1989, Koppers, under USEPA oversight, began removing and treating contaminated groundwater with a carbon adsorption process, treating the contaminated soil in place, capping the wood treating area, providing a permanent water supply to those residents with contaminated wells, and discharging treated groundwater to the aquifer. Two groundwater extraction and treatment systems were installed: one on-site (400 gpm) and one off-site (600 gpm). The treatment facilities were effective in reducing groundwater contamination to the extent that on-property and off-property plumes are no longer connected. The off-property treatment facility was taken off-line in December of 1995 as the plume degraded and no contaminants were being removed by the extraction wells. The residual off-property plume is no longer being fed by contaminants and has assumed a stationary position which is being monitored. In 1999, an in-situ bioremediation program to assist in PCP degradation was initiated and incorporated into the remedy for both on-property and off-property plumes. The program calls for the addition of nutrients (diammonium phosphate) and oxygen (magnesium peroxide) to the groundwater and monitoring of results. The PCP concentrations in the off-property wells are decreasing. The on-property treatment facility remains in operation and is containing contaminants. The PCP concentrations in the off-property wells are decreasing. No additional monitoring is proposed for this area since contamination is contained and undergoing cleanup and monitoring is being performed under USEPA guidance.

Adjacent to the Koppers Superfund Site is the Louisiana-Pacific Superfund Site consisting of a 100-acre wood processing plant and a 115-acre landfill. The plant was built in 1969 and consists of a log deck and log deck pond, a sawmill (recently dismantled), a kiln dryer, the planing mill, a hardboard plant, and wood particle storage areas. Site-related chemicals, primarily arsenic and formaldehyde, have caused low levels of contamination in the shallow aquifer beneath the plant. Dust samples have shown contamination with PCP, formaldehyde, and other volatile organic compounds (VOCs). Contaminants found in sediments include PCP, dioxins, furans, heavy metals, and polynuclear aromatic hydrocarbons (PAHs). Surface water contains PCP and heavy metals including arsenic, boron, and copper. In late 1990, the USEPA issued an interim Record of Decision. The interim soil remedy included site access restrictions, such as a perimeter fence, deed restrictions on future residential use of the site, and additional soil sampling. The groundwater remedy included establishing well permit restrictions and monitoring of on-site wells to obtain additional information about formaldehyde and arsenic levels in the groundwater at the site. The additional soil and groundwater investigations were completed by early 1995, and in August 1995 the USEPA determined that no further cleanup actions are needed at the site. The site was delisted in November of 1996. No additional monitoring is proposed under this study plan.

About 1/4 mile northeast of these two Superfund sites, the Western Pacific Railroad Company operated a 90-acre rail yard from approximately 1920 to 1983. Union Pacific

Company purchased the facility in January 1983. On the facility was a wooden structure encompassing approximately 3 acres, known as the roundhouse, which was used to fuel, repair, service, and clean railcars. Specific activities conducted at the roundhouse include sandblasting, welding, cutting, and fabricating. As a result of these activities, waste solvents, oils, grease, and waste waters containing heavy metals were discharged to an unlined surface impoundment until October 1987. Monitoring has detected arsenic, barium, copper, nickel, chromium, benzene, and toluene in soil and sludge in the impoundment, and chromium in a monitoring well adjacent to the impoundment. Because of this contamination, this site was also placed on the Superfund list. In 1989, the CVRWQCB issued a Cleanup and Abatement Order, which involved removing soils and sludges associated with the surface impoundment, closing two 30-gallon concrete sumps, removing an underground tank, closing an underground oil/water separator, and replacing the separator with an above ground unit. An extraction system was also installed in 1994 to pump and treat a plume of contaminated groundwater near the former underground storage tank. In early 1997, a second groundwater extraction well with a soil vapor extraction (SVE) unit was installed to remove 1, 1-DCE from the groundwater and soil. By the fall of 1997, contaminants in the groundwater had decreased below cleanup levels. The groundwater extraction system was turned off in 1999 and the SVE system was turned off in November 2000. In March 2001, Union Pacific Railroad filed a deed restriction with the Butte County Recorder which restricts future use of the property to industrial uses only. The USEPA has determined, and the State Department of Toxic Substances Control concurs, that no further response action is appropriate under CERCLA. The site was deleted from the National Priorities List (NPL) on August 29, 2001. No additional monitoring is proposed under this study plan.

There are four parcels totaling 10 acres zoned industrial warehouse activity in the same area as the vacant industrial acres. Most of this acreage is concentrated at one parcel containing a mini-storage facility on State Highway 70. Customers can store any personal belongings, including motor vehicles, trailers, and boats, at this facility. The potential contamination concerns would be primarily petroleum byproducts from stored motor vehicles, which may in time leak oil, grease, or other fluids. However, due to the relatively small size of the facility and the limited amount of vehicle parking, there is no significant concern for contamination from this facility.

There are ten parcels totaling 94 acres zoned miscellaneous industrial scattered throughout the 0.5-mile buffer assessment area. Nearly 78 acres of this is concentrated in two parcels associated with a rock-and-gravel facility west of State Highway 70 along the Feather River. Potential contamination from this site would be sediment discharge from the gravel operations. Since gravel is removed from the gravel and cobble area adjacent to the Feather River and not from the river itself, this part of the operation should not be a concern. However, surface runoff following rains could transport sediments to the river. Since these gravels are tailing piles associated with gold mining activities, they may contain mercury that was used to trap gold from the sediments. Runoff from the site could transport mercury to the Feather River. The CVRWQCB apparently has not issued

a National Pollution Discharge Elimination System (NPDES) permit for this facility. Therefore, runoff from the facility will be monitored for sediments, turbidity, and mercury during the rainy season.

There are 332 acres zoned industrial that are vacant within the 0.5-mile buffer assessment area primarily east of the Feather River along State Highway 70 in the southern portion of the City of Oroville. These acres do not have any on-going industrial land use activity at this time. Most of this area, regardless of land use designation, is vacant or has some light commercial activity with minimal potential for discharge of contaminants. Therefore, no monitoring is proposed for these areas.

### Railroad

There are railroad right-of-ways (ROW) throughout the project area. Within the 0.5-mile buffer assessment area, there are 23 parcels totaling 101 acres of railroad ROW. These ROWs are heavily rocked, so fine sediments are not a concern. There may be a minor concern with contamination from diesel from the train engines and metals from the tracks. However, area-wide water quality monitoring for metals is already occurring under Study Plan SPW1 and monitoring for petroleum byproducts is proposed for commercial land uses under this study. Since these parcels are small and widespread and sampling is already occurring under another plan or proposed for another aspect of this plan, no additional sampling is proposed for this type of land use.

### Residential, Roads and Streets

There are 5,050 parcels totaling 7,700 acres of residential (all types except vacant), averaging about 1.5 acres and ranging from 0.1 acres for a small city lot to 227 acres for a single-family ranch. Many of these parcels are within and around the City of Oroville, but extend throughout the area. The parcels around Lake Oroville and outside of the City of Oroville tend to be larger, averaging about 10 or more acres per parcel. Additionally, there are 2,462 parcels totaling 13,937 acres of vacant residential land within the assessment area.

There are several concerns for potential contamination from developed residential land uses, including pesticides and fertilizers from lawn care applications, organic loading from yard and lawn clippings (including fallen tree leaves), fecal contamination from domestic animals (i.e., pets), sediment from lawn care or alteration, and petroleum byproducts from high-density surface traffic. The urbanized areas in and around the City of Oroville have a greater potential for contamination than those larger parcels outside the city due to the greater density of homes and impervious surfaces.

The impervious surfaces (roads, parking areas, and sidewalks) receive deposition of petroleum byproducts from the surface street traffic (cars and trucks) and the

contaminants from residential areas. They then act as conveyances of these contaminants into the drainage system, which drains into adjacent surface waters.

Under Study Plan SPW1, several stations along the river in the urbanized areas of Oroville are currently being monitored for water quality, including bacteria and pesticides. However, this monitoring would not capture the water quality of the surface runoff from the urbanized areas. Three representative stormwater drain outfalls within the City of Oroville along the Feather River and one representative stormwater drain outfall at Kelly Ridge that empties into Lake Oroville will be sampled for bacteria, metals, nutrients, pesticides, petroleum byproducts, and physical parameters at the first three storm events that produce significant surface runoff.

### Miscellaneous

The miscellaneous designation (RZ) covers those lands that are outside of an easily defined land use description, and includes State and federal lands within and adjacent to the project area. Within the project area, there is a total of 42,087 acres of miscellaneous lands, which are primarily mixed recreation and natural lands that do not have much developed use. Within the 0.5-mile buffer assessment area, there are 109 parcels totaling 162 acres of State lands and 99 parcels totaling 6,072 acres of federal lands. These State lands include the CDPR managed Oroville Off-Highway Vehicle Area (also known as the claypit) located off Luther Road south of State Highway 162.

On mixed recreational and low use lands, the potential effects to water quality would include erosion-caused sediment from unsurfaced roads and OHV use, fishing related concerns (nutrients and petroleum byproducts), and pesticides. However, except for the developed recreational facilities located in and around the project area, these lands are not high use areas. Potential effects to water quality from the recreational facilities on these lands are addressed in Study Plan SPW3. Visual surveys for erosion during the rainy season is proposed for the lands outside of the developed recreational facilities. If any erosion is deemed significant, then potential sources will be identified, monitoring for deposition and turbidity will occur, and remedial actions will be instituted, if appropriate, or recommended.

The CDPR treats certain areas near project waters with various herbicides. Around the developed recreation area of the North Forebay, CDPR applies the pre-emergent oryzalin (Surflan) along the roadsides and glyphosate (Roundup) along the roadsides, parking lot, and around the bases of ornamental trees. For the past two summers, CDPR has been spraying glyphosate (Rodeo and Aquamaster) around the perimeter of the Thermalito Forebay to kill purple loosestrife. All of these chemicals are approved by the USEPA for these uses. Oryzalin adsorbs strongly to soil particles and is not very soluble in water. However, oryzalin can enter aquatic systems as a complex with silt and soil particles. Oryzalin may be toxic to fish and aquatic invertebrates and may bioconcentrate in aquatic organisms. Glyphosate is soluble in water and may be toxic to fish and invertebrates,



though a surfactant (polyethoxethyleneamine) packaged with the Roundup formulation of glyphosate may be responsible for most of the toxicity. Rodeo uses Ortho X-77 as the surfactant and is approved for application over water. Oryzalin and glyphosate will be monitored from water samples collected from the North Forebay. Samples will be collected if rains and surface runoff follow spring application, during the summer following application for purple loosestrife control, and in the fall after fall rains produce significant runoff.

In addition, the Butte County Mosquito and Vector Control District treats the Oroville Wildlife Area with methoprene and malathion for mosquito control. Both chemicals are approved by the USEPA for this use. Methoprene, which is an insect growth regulator, is applied to water to inhibit mosquito maturation. At concentrations applied for mosquito control, methoprene is not toxic to birds, fish, or most aquatic invertebrates, though midges are affected. A breakdown product of methoprene may mimic retinoic acid, which is an important chemical to the development of fish and frog embryos. Laboratory tests with elevated levels of retinoic acid have resulted in limb deformities in frogs. Malathion, an organophosphate pesticide, is applied as a mist to control adult mosquitos. Malathion is toxic to aquatic organisms and has been implicated in the decline of frog populations. The District targets small, isolated water bodies for treatment with methoprene. Larger water bodies that support fish usually do not need treatment for mosquito control. Water samples will be collected for analyses of methoprens and malathion several times during the summer from representative persistent ponds that are treated with methoprene or are in the vicinity of malathion treatments. Persistent ponds will also be sampled for zooplankton and aquatic invertebrates. A control pond in an untreated area will also be sampled for comparison.

## **7.0 Conclusion**

This study plan addresses the potential contamination concerns that could affect project water quality from watershed and land use management activities in the vicinity of the Oroville Project. Concerns that were identified include potential contamination from chemicals, sediments, nutrients, bacteria, petroleum byproducts, and metals.

Water quality monitoring for most parameters of concern is occurring at water quality stations under SPW1. This study plan proposes additional monitoring at sites not monitored under other study plans.

Potential effects from agricultural land uses will be monitored by monthly visual inspection for turbidity plumes into project waters. If significant turbidity plumes are identified, additional sediment and turbidity monitoring will occur.

Potential effects from commercial land uses include discharges from commercial activities in and around the City of Oroville, gravel plant discharges, and residential runoff. Petroleum byproducts (PAHs and MTBE) will be monitored during the first three significant storm events at sites along the Feather River currently monitored by SPW1 that are affected by runoff from the City of Oroville. Sediment production, turbidity, and mercury will be monitored at monthly visits during the rainy season to the principal discharge sites from the gravel plant adjacent to the Feather River south of Oroville. Residential land uses will be monitored at three stormwater discharges from the City of Oroville to the Feather River and one discharge from Kelly Ridge to Lake Oroville during the first three storm events for bacteria, metals, nutrients, pesticides, petroleum byproducts, and physical parameters.

Miscellaneous land uses will be monitored by visual observation for turbidity plumes to project waters, in conjunction with agricultural land uses monitoring.

Chemical treatment for pest species will be monitored at the Thermalito Forebay and Oroville Wildlife Area during the spring to fall. Water samples will be collected from the Forebay for analyses of oryzalin and glyphosate. Ponds in the Oroville Wildlife Area will be monitored for methoprene and malathion. Representative ponds will also be sampled for zooplankton and aquatic macroinvertebrates.

Monitoring will begin during the fall of 2003 and continue to the spring of 2004. Subsequently, a report discussing results will be prepared. Interim results will be provided to the Environmental Work Group as requested.